Notebook, N-99-12-15

Galvanic Cells. (Pirago)

= 9.05

Dec 15 1799.

Pt plates heated with $AgNO_3$ Solution

#39 Weight 14.65g
" Cu_2O (Silver Lake) shook with soda water,
Absorbed 1.3g $AgNO_3$ sol 5%
and washed.
4.3, 3.5 - 3.8 - 2.5 -

#40 Weight 13.3g
Li_2O Na with Soda
Absorbed 1.25g 10% Sol $AgNO_3$ &
washed
3.8 - 2.4 - 2.9 - 2.5 - 2.4 -
4.26

41 W = 14.15 g
Silver lake plate with soda
Abs 1.3 g Sol Ag NO3 20% aqueous
4.0 - 3.5 - 3.5 - 2.2 - 2.8

42 W = 14.02
Silver lake w. soda
Abs 1.25 g Sol AgNO3 30% aqueous
3.3 - 3.5 - 3.2 - 2.1 -

#43 W= 14.7g
Silv lk w sorb
Soaked in 5% Sol AgNO3 and
baked. Amount of Ag unknown
on reason of the chem reaction
4 -3.7-3.5- 1-3.5

#44 W= 13.1g
Silv lk w sorb
Soaked in 10% Sol AgNO3 and
baked
3.8 - 3.4-2.2-2.2-2.4
4.2

#45 W= 13.65g
Silv lk w. sorb
Soaked in 20% Sol & baked.
4.0-3.5-2.8-2.8

Amount of Ag = $\frac{107}{169} \cdot 1.25 = 0.05$ =

= 0.0389 g

for 15 lbs CuO : 0.62 oz

Price = ~$0.35

Price of silver for 15 lb CuO

$\frac{16}{10} \cdot 0.113 \cdot 0.58 = \$1.10$

#46 W = 13.9 g

Sulfide W Soda

Absorber 1.25 g 5% Sol $AgNO_3$

and baked

3.1 - 2.9 - 2.2 - 2.5 - 3.2 - 2.5

83.2%

#47 W = 11.52

Ab 1.00 g 20% Sol $AgNO_3$

and baked

3.1 - 3.2 - 2.9 - 3.2 - 2.5

49.2%

#48 Sulf lb stock W Potash

W = 13.00 2g Sol $AgNO_3$ 5% and

5.8 - 4.4 - 3.0 - 3.2 -

#~~46~~ w = 13.76 g

~~Dark reddish brown KBH~~

~~#49~~ w = 13.42

Kid ~~Pk~~ slurry in ~~Cyclo~~ Cyclohexane, washed on by $AgNO_3$ solution removed

3.2 - 5.0 - 3.9 - 4.0 - 2.0

#~~47~~ 13.42 Silvlle with 2.5% NH_4Cl; 2g $AgNO_3$ Sol. 50% washed

3.7 - 3.2 - 3.0 - 2.6 - 3.2 - 5.0

~~52~~ 13.3 g
Dilute lk with $Cu(C_4H_9O_2)$
1.7 g Sol $AgNO_3$ 50% & wash
4.3 - 3.6 - 3.9 - 3.2

~~53~~ 14.35 g
Dilute lk with $Cu(ClO_4)$
1.7 g Sol $AgNO_3$ 50% & wash
4.8 - 5.5 - 7.4 - 3.9 - 2.6

~~54~~ 12.1 g
Dilute lk with $Cu(CN)_2$
1.8 g Sol $AgNO_3$ 50%
3.9 - 4.9 - 3.2 - 2.7 - 2.6

#55 13.75
Silver Ha with CuCl
2g Sol AgNO3 50%
41-47-37-30-32

#56 11.20
Silver Ha with CuBr2
25 Sol AgNO3 50%
40-49-34-35-29

#57 13.65g
Silver Ha with 50% Psol NuidA
25 AgNO3 (50%)
41-49-34-34-30

*) Cell charged 2-3 amp. Hour after the loss of 4 amp hour for heating taken

58 12.95 g
Silv lk with 10% Rolle Munch A
2g $AgNO_3$ (50%)
6.5 - 6.0 - 4.5 - 5.8 - 5.0 4.5 - 4.7
*) 4.1, 4 - 5.1 5.6 4.9

59 14.35 g
Silv lk with 5% Rolle Munch
2g Sol-$AgNO_3$ 50%
3.5 - 4.1 3.2 - 3.6

#60 Silv lk Locher work in acetat
14.55 g 1.3 g $AgNO_3$ (50% sol)
5.0 - 5.2 - 5.5 - 4.8 - 4.9 5.0 - 8.9
⊗ 3.7 - 3.2 - 3.5 - 4.6 5.1

#61 14.65g
Titr. die kochende warme Eisenchloridlsg
2 cg 5%ige Sol AgNO3
5.2 - 5.8 - 6.8! - 5.8
6.5 - 6.3 - 5.9 - 5.7

#62 14.15g
Titr. die warme Eisenoxidlsg
1.3g 5%ige Sol AgNO3
5.7 - 6.0 - 5.2 - 6.1 - 5.3 -
5.0 - 4.2 - 5.1 4.6 - 4.9

#63 14.50
Titr. die warme Eisennitratlsg
1.3g 5%ige Sol AgNO3
6.5 - 6.0 - 6.4 - 5.9 - 5.2
5.2 - 5.2 - 5.9 - 5.5 - 4.6

#6Y 12.5

Sev lk with 50% Tufnova
1.7g 50% sol CoNO3
4.1 - 3.9 - Y.0 - 3.2 - 3.1 - 3.6

#85 15.1g

Sev lk patch with
2.0g 50% sol AgNO3
4.7 - 3.2 - 3.2 - 2.8 - 3.1 - 2.0 - Y.1

#66 9.45g

Sev lk patch with dilute
HNO3 (contains a 50% sol of
the crystallized CuSO4) Allow drying
washed in Tola and wooster.
2g 50% sol AgNO3 and washed
4.3 - 3.2 - 3.2 - Y.0 - 3.7 - Y.0 - Y.1

More readily dissolved in soda than most plates.
*) see remarks on page 8.

#67
Redmond Copper sable (.16 g wet) acted on by 0.1 fol AgNO3. Thin grey black deposit over the scale (ca 11.5 Sn grid.
4.0 4.5 – 4.5 – 4.0 – 3.7 – 4.8 – 4.0 –
4.2 – 4.5 4.2 – 4.0 – 4.7
*) 4.7 – 4.2 –

#68 Redmond Cincade acted on by AgCN dissolved in KCN. ca 11.5
2.3 3.8 – 3.2 – 4.1 – 3.4 – 3.4
– 3.1 – 3.2 – 2.9
*) 3.9 – 3.2 – 2.5 – 2.5 – 3.0

#69 Redmond Cincade 95-2
" " " treated in
#68 5% (ca 11.5
2.5 – 2.2 – 1.2 – 2.1 – 2.0 –

#70 ca 10g
90% plain redhead seeds
10% silver coated seeds
4.4 - 3.2 - 1.7 - 1.3

#71 ca 10g
20% silver coated seeds
3.0 - 4.7 - 3.9 - 4.5

#72 ca 11g
35% silver coated 65% plain Cirsella
3.2 - 3.2 - 3.5

5

13

#73 ca 12g
50% chromes, 50% plain.
Fine scale
2.4 3.0 - 3.2 - 3.0

#72 [illegible]
[illegible]
3.4 - - - - - - - - 0.5-0.2

15
10 5 —

#75 - [illegible]
[illegible]
132

alls to pipes

12
11
1 2
13
1.5

#76 15.8 x 3 = 6.53 g

15. Copperscale 50 mg $CgeNO_3$
2.6 - 2.4 - 2.9 - 3.0 - 3.1 - 2.5 - 2.9
47% 47% -
2.9 - 2.9 - 2.2 - fresh water - 2.3
x) 3.2 - 2.1 - 2.4 - 2.6 - 2.7
(71%)

#77 15 g Copperscale (50 mg $AgNO_3$)
w = 5.3 g
2.3 - 2.7 - 2.5 - 3.0 - 2.4 - 2.4 - 2.4
57%
fresh water 2.0
x) 2.3 - 3.4 - 2.1 - 3.4 - 3.5 - 3.8 - 3.0
- 3.0 (or 2.2) - 2.2 (1.8) 1.0 (79%)

#78 8.35 g
Ag Copperscale, a 500 mg $AgNO_3$ crusher after precipit.
2.9 - 4.5 - 4.6 - 4.6 - 4.7 - 4.8 - 5.0
fresh water 5.1
x) 5.0 - 5.3 - 4.8 - 5.5 - 5.5 - 5.6
5.5 - 5.4 - 5.7 - 5.7 - 5.1 - 5.0
82%
(of 4.5) 5.0 45

Best qual

Price per lb 53.4 cts.
x) see remark on page 8.
This remark like all others containing words of copper colouring the soda blue, especially during first oxydation and when overoxidizing" (page 8)

#79 (= 7.2.)
1b Copperised covered with
0.100g Ag(NO3) crystals.
2.6 - 2.8 - 3.0 - 3.0 - 3.5 - 3.8 - 3.c
fresh soln - 3.5 - 2.9 - 2.9 - 3.9 - 3.2 - 3.4
15%

#80 4.7
(Electrolyte) in 2/1000 Copper foil
on one side covered w. glass
- Cut in small pieces - in gm
05=
5 first times below 1.
0.6 - 0.8 - 0.8 - 1.0 - 1.2 - 1.3 - 1.0
5 to 7%

#87 3.25
1/1000 Copper foil Pinfolded on one
side w. AgNO3 - Small pieces
in grid.
.07 - 5 times below 1.0
0.4 - 0.4 - 0.7 - - -

#53 6.55 g
2½/1000 Copperpenk (Electrotyp)
5 times below 1.0 - 0.4 - 0.4 - 0.4 .

#85 Pale at [illegible]
[illegible] marble [illegible]
3.0 - 3.1 - 2.9 - 3.3 - 3.6 - 5.x²
3.7 - 2.0 - 3.1 - 3.1 2.0 5) 4.5 - 3.5

#84 Dark [illegible]
[illegible] 1.46g
4.8 - 5.8 - 5.8 - 4.2 - 4.0 - 6.8 -
4.2 - 4.0 5) 6.8 - 6.4 - 6.5

#85 1419
Plate stuck with Fluoride
of Copper 2g Wilh. coppered
5.4 - 5.8 - 6.6 - 4.0 - 6.6 - 5.6 - 4.0
✓ 6.6 - 5.6 - 6.0 — —

#86 1439
Plate stuck with Fluoride
of Copper absorbed 2g Cp/Wh.
5.4 5.8 5.2 - 5.8 5.4
✓ 5.1 - 5.1

#87 6.9
2.5 [illegible] coppered
on one side [illegible] has
small pieces and organisms at
red light
2.1 - 3.0 - 2.8 - 3.5 - 3.1 - 3.4 —
(61%)
4.0 - 3.2 - 3.4 - 2.8 fast Sola
✓ 4.0 - 3.2 - 3.7 - 3.4 - 2.5 - 3.2 - 2.4

xy See remarks on pag 85.

#38 Pole
Basket
Caught Yellow, Rainbow
4.0 - 3.8 - 4.2 - 4.0 - 3.1 - 2.5 3.7
3.3 - 3.2 - 3.9 4.2 - 4.0 - 3.5

#87 Pole 13.5
Bill like
Basket
4.2 - 4.5 - 3.4 - 3.5 - 4.6 - 3.7

#90 Pole 14.3
Basket
4.0 - 3.5 - 3.1 - 3.5 - 3.2 - 3.1
4.5 - 3.5 3.2 - 3.4 - 4.2 - 4.1

#91 3 3g
1/1000
in cyanide, 9 mL
0.0 - 0.4 - 0.3 - 0.3

92 14.5
Plate struck with 50 Ω
(#43) [illegible] and reading used
at rebeat. 2g 50% Ag/Cu
29 - 50 - 40 - 48 - 51 - 5.8 - 5.2 - 5.1
#5 -

#93
Plate struck w 5 mA/cm²
Thiourea 1.5 g Ag Cl [illegible] used
in KCN [illegible] 0.05 g Ag
and rebeat
44 - 40 - 39 - 28 - 2.9 - 3.1

#94 1407

Plate with Cinsalt

2.1g of Sol AgNO3 in KCN, 13.5 g of which contains 2g AgNO3 (.85 g Silver)

incubated

2.5 - 2.3 - 3.7 - 3.2 - 4.2 - 2.4 - 2.8

3.5 - 4.0. 3.7 - 3.3 -

#95 14.15

Plate with Cinsalt

Absorbed AgNO3 containing .18 g Ag. and related

36 0.35 - 3.4 - 3.2 - 8.2 - 4.5 - 4.0 .45

4.7 - 6.3 6.2 - 6.0

#96 Not registered Cinsalt Treated with AgNO3. Amount of Ag unknown (very high)

3.1 - 3.0 - 2.0 3.2 - 3.0 1.8 - 2.2 - 3.2 2.1

3.0 - 3.3 - 2.1

Price per lbs 25.1 ch

* charged 2-3 thumbtacks after begin of pouring and time for reducing taken

32.2 ch

21.5 ch

#97 6.05 g
Reducer Cu scale 15 g
$AgNO_3$ in sol 0.100 g
crushed when dried
2.4 - 2.6 - 2.9 - 2.2 - 3.1, 3.4 - 3.2
fast soda * 2.4 - 3.7 - 2.4 - 3.4 - 3.5
3.5 - 3.1 (74%)

#98 6.2 g
Reducer Scale 15 g
$AgNO_3$ — Crystals 0.100 g
broken up
2.6 - 3.4 - 3.5 - 3.6 - 3.7 - 3.7
fast soda * 3.7 - 3.4 - 3.7 3.7 3.7 3.0
2.9 - (1.2 m) - 2.3 (rest 16) (72%)

#99 6.95 g
Reducer scale
$AgNO_3$ in Cyanide sol: 0.050 g
dried and broken up
3.0 - 3.2 - 3.1 2.9 - 3.0 * 3.5 - 4.5 -
3.5 - 4.1 - 4.0 - 3.8 - -

#100 6.5 g
Navy brown [illegible] coarse [illegible]
massive mass). [illegible]
0.5 – 0.9 – 0.8 – 0.7 – 1.1 – 1.1 – 1.0

#107 8.75 g
[illegible] ½" strips [illegible]
0.5 – 0.9 – 0.8 – 1.0 – 1.1 – 1.0 – 1.1

#102 3.0 g (before exp.
[illegible] rocker ambo grist and assigning
for red heat.
1.5 – 1.4 – 1.7 – 1.5

32 ctr pa lbs

#103 4.5

Chicken meat separated on the surface and collected in gut

1.4 - 1.4 - 2.5 - 2.6 - 2.2 - 1.3 - 1.7

67%

#104 9.5g

15g Ultrasil added 0.2g AgNO3 in the ground position

Pellet added, broke up and brown mushes

4.3 - 4.8 - 5.5 - 4.2 - 5.2 - 5.1 - 5.3 - 5.3

5.2 (on 41) 4.6 - 4.4 - (0.40) 4.1 - 4.2

4.7

#105 ad 10.4 8.95g

Stomach band

3.5 - 2.4 - 5.1 - 4.0 - 4.2 - 5.8

4.7 4.1

5.4 - 5.0 (4.2 on) 4.4 (4.1) 4.2 4.2

#106 Co 104 & 105 6:2
Stopped Crosby
2.6 - 3.3 - 2.9 - 2.6 - 2.8 - 3.1 -
(4x 1.2) - 3.1 - 3.0 2.3 - 1.4 -

#108 6.9
1% calc, 0.15 g $Cu(NO_3)_2$ crystals
Scale broke through cell
3.5 - 4.0 - 4.0 - 4.0 - 4.0 - (0x 3.4)
4.9%
3.5 - 3.5 - 3.9 3.5 3.1

#107 6.5
Co 108 - Scale cleaned in HNO_3
4.1 - 4.1 - 4.2 - 4.2 (6x 3.0)
7.8%
3.1 - 3.0
3.4 - 3.5 - 3.3

#1107 12.8

Plate: 75% Cu 25% Ni Ke

Stock work into Lode (at

contact on E Quartz vein

Tunnel on Lehigh Tunnel

As Pinchung [illegible]

4.45 AH

#111 14.55

75% Cu 25% Ni

on 110

#112 14.85

on 110

Duty for Amp. hr. of Resistance

= Resistance 7.8 amph

= 7.8 AH

#113 as #111 12.2

Only for Length of Reduction Section 68%

= 75% × 0.91

#114 9.45 g
Melted Cu Crystal crucible to
give about 1/32" in grind
3.0 (Of 3.0) rubbed) - 3.1 - 3.0
(3.0) 3.8 (2.1) 2.8 2.8 · 3.0 —

#115 5.3
15% Cu Leach 0.25 g Ag/Cu
contents cyanide
Bar the grist is a
mix of unknown Copper
wire (1/16" x 15/32") mounted
on a hard copper wire
3.1 - 3.1 - 3.0 3.1 - 66%
Of 2.8. Ours 2.0 Rev 3.0
(2.9) 3.0 2.8 - 3.0

#116 6.17

15 g Cinnabar 0.15 g 0.3 g/l

brown Chromatin granules

spectrum — gold with a

continuous bilirubin copper

wire

~3.7 - (2.8 m) - 3.4 - 3.5 - (2.7 m)

67% 61% 63%

- 3.4 (2.8 m) 3.1 3.2 - 3.0

#117 4.85

Bismuth Hydroxide granules

visible dumps

0.8 - (0.6 m) - 0.8 - 0.5

#325

#118 8.4%
Melted Copper oxide of any kind reduced by current
silvered in cyanide (Ag Cl, NaCN, Na2S)
then broken up, screened on 100
and powdered in mortar with silver
red copper wire
3.7 (3.80x) 3.4 - (2.1)
(2.9) 3.0 2.6 - 2.5 3.0 —

Grids written melted oxide
colour liquid dark blue,

#119 9.0
as 118, not broken up after
silvering
2.7 3.1 - 3.0
41.5%
(3.1) - 3.2 2.7 - 3.0

30

120 20.53 melted B_2O_3

For fusing it which may be reduced. ~~$B_2(OH)_3$~~ can be reduced.

~~0.9 AH~~ ~~2.7 AH~~

~~0.9 AL~~ ~~0.27 O~~

3.1 - 3.0 - 4.0 N.G.

First observation wrong.

121 11.105 melted $Si\,O_2$.

for reducing.

3.75

122 3.25 $Si(OH)_4$

for reducing. 3.25 - 7.35 1.05 AH

#123 13.92g Plate
75% CuO 25% MnO$_2$
Stuck with Pitch, and dried
in oven (below 250 °C)
Put into cell with Zinc.
(Falls to pieces.)

13.92
after burning 13.62
13.92 · 025 = 3.48
MnO$_2$ = 55 + 32 = 87
87 : 13.48 = 16 : x
$x = \frac{13.92 \cdot 32}{87} = 0.64$ g.

One Atome of O corresponds
to the weight 0.64 g.

Continued on 132 w = 13.62
6544

#124 16.2 g Plate

25% Bi_2O_3 . 75% CuO only dried

Put into complete cell

Falls to pieces

#133 13.15 g

25% Mn_2O_3 , 50% CuO.

baked.

Complete Cell

Volts: 1.100 pH: 6.5

#125 13.12 g Plate
25% MnO_2, 75% CuO
Dried in oven; (Soda
Falls to pieces

#126 18.7 g Plate
25% Pb_3O_4, 75% $BiVO_4$
Dried, (Soda)
Falls to pieces

#127 3.55 g
Pt (OH)
.08 · ~~0.37~~ | 0.8 - 0.7

#128 5.65 g

Silver Cu scale (0.5 x #15)
packed in grid with silver
copper wire. Final ox: 2:1

Rev. 30 = 64%

(Ox Rel). Rev 30
2.8 - 2.9 - 2.6 - 2.7 - (2.8) - 2.6 - 2.7

#129 Silver copper scale (05:15)
Packed with silver copper
wire W = 6.4 g. (- wire)
4.0 - 3.1 (0x 3.1) (3.1) 3.4
75%
(3.0) - 3.9

#130 W = 6.05 (- wire)
Silver scale (0.5 : 15)
broken and packed in grid
with silver wire.
3.5 (6.3-0) - 3.4 4.0

Weight of Bismuth - depos. Coringa for Amp. Hour current

1) By code of reduction from Bi_2O_3 to Bi_2O_4:

8.7 g

2) From Bi_2O_4 to Bi_2:

4.35 g

The same for Copper

per Amp. Hour 1.5 Amp. Hour

The ratio of specs grouches

$CuO : Bi_2O_3 = 6.4 : 8.3$

The data for the determination of the voltage from the heats of formation can not be obtained for Bi_2O_3, Bi_2O_4 — only for Bi_2O_3 (Brit) this case is one given only not able to follow the

process.

The cell gases after the developing of 3 H at the Bismuth pole, and still the product seems to be Bi_2O_3 (black, heavy, crystalline)

By heating the product to red heat, it gives about half of Bi and half of yellow Bi_2O_3.

Does this oxyding an appearance of the lower pole, reducing till below to Bi_2?

#131 .7g

Copperoxide, solvent (0.5 : 15) boiling in water and washed with solvent water, the end of which is soluble to the grid.

4.0 - 3.6 - 3.9

68% 62% - 67%

(3.1) 3.5 - 3.6

On the precipitating of the Sodium cuprate by means of Alum Tannate.

According to the precence of organic matter hinders the dissolving of the $Cu(HO)_2$. By mixing the cuprate soda with the Tannate, the colour at first disappears, after a short while it turns light blue again.

#135

When CuO of plate is reduced, the lead is deposited on the copper-pole and spongy state.

#134 Plate 16.8 g
75% Pb_3O_4 75% CuO
stuck with soda and baked

#135 Plate 15.55 g
25% Pb_3O_4 75% CuO stuck
with soda and baked
complete cell.

#136 7.95g

Copper scale, silver (in prep: 15A : 0.25) broken through screen and leached in grid with ca 12 pieces of silver wire, all of which have end soldered to the grid.

(0.8g wire)

Ox. 4.3 = 85% (Ref.)

Red 5.2 = 79%

(See Ox 4.3) Ref.: 7.8

(Ox 4.3) 4.8 (4.0) 8.5 ?

4.3 4.7 ?

Used for plating exp.

21/3 '02

The Tannate of Alumina does not seem to prevent the aging into salts of the Cinchonine. Following salts tried:

Tin arsenate	Nickel tartrate
" phosphate	" citrate
Ammon chromate	" & Cobalt sulphate
Ammine "	" Alum tartrate
Tin Ammon chloride	" " sulphate
" Potassium "	" benzoate
" Bismuthate	
" nitrate	
" Oxalate	
Tannate	
Tartrate	

Magnesium carbonic.	Strontium bromat.
bromat.	arsenic.
chromat.	carbonic.
phosphoric.	formic.
phosphoricum	hyposulfuric.
pyro phosphoric.	nitric "
silicat. anhydric.	
formic.	
sulphuric. exsiccat.	
Magnesium & ammonium	
phosphoric.	
chloratum	
arsenic.	
sulphuric.	Bismuth. bromat.
	" citric.

Zinc arsenate	Lead carbolate
" lactate	" malate
" ferro-cyanide	" cyanide
" tannate	" citrate
" valerate	" antimonate
" oxalate	" butyrate
" chlorate	" ethylsulphate
" silico-fluoride	" tungstate
" chloro-iodide	" acetyl tartrate
" hypophosphate	" phosphate
" iodate	" sulpho-naphtate
" citrate	" pyrophosphate
" arsenite	" salicylate
" salicylate	" benzoate
" phosphide	" sulpho-cyanide
" phenate	
" tannate	
" phosphite	
" chromate	
" sulphite	
" picro nitrate	
" benzoate	
" ethylsulphate	
" thiosulphate	
" formate	
" sulpho carbolate	

Zinc chlorid cobalch
Zinc. amm. chlorid
" sulphate
" & calcium cyanide

Experiments on the action of the Alkaminium Tannate.

78, 98, 104, 105, 108, 109, 125.
At start of oxidizing dissolve in the cold different amounts of the Tannate:
0.020 g Tannate, cell becomes green at the time of beginning of gasing.
0.030 - 0,050 g keeps the cell yellowish brown for some hours after gasing begins
0.070 . 0.100 - 0.120 does not show much difference from 0,050 g but does not prevent the copper oxide from going into solution and being deposited on the platinum pole

#137 3.17
$Bi(OH)_3$ on grid
1 AH corresp to 3rd H.
OA 0.8 MA

#137 8.67 Plate (111)
75% CuO 25% Mn_3O_2
baked 4h dull red
4.5 AH (8.67 g CuO on 5.8 g grid)

#137 9.75 Plate (112)
75% CuO 25% PbO_2
baked bright red, bill at Kinnear
grey 4.9 AH. (7.75 CuO : 6.55)
4.9

#140 6.32 grit

Silvered scale (0.45) with 12 doubled cu-wire holders ends are soldered to the grid.

(310/2) Pinton: 49.5% Ref: 66.4% (35)
(2.6) 3.0 (30) 1.0 (2.8) 3.0 (28) 3.2

#141 Plate: 13,1

95% CuO, 25% MnO₂.
Bohor at red heat — tray to oxidize before refining.

6.38 HH corresponding to 92% of theoretical reduction of the CuO alone. Unsignificantly MnO can not be much reoxidized

Dissolves partially

MnO or MnO dissolves in the liquid, especially when oxidizing

142 Grid. Weight of silver
scale: 6.00g., of wire 0.40 g. 6.40
Scale silver 15.85 brother and
pocher worth 20 wires, which
marks are solders to grid.
(0×3.2) 3.7 (3.3) 3.8 (3.8) 3.4
(3.5) - 3.8 (7½) 80%

143 Weight of silver scale: 6.00
Silver in proportion 15.0.3,
brother and pocher worth 0.80 g
of silver wire (15 silver), solders
to grid. —

(3.3) 4.0 (3.3) 4.0 (3.3) 4.3
66% 80% (66%) 80% (66)

#144 6-35

Through 40 mesh
silvered scale 0.3-15.
0.15 g silvered wire (20 doubled)
(2.6) 3.1 (3.0) 3.4 (3.3) 3.9 (3.3) 3.6

Mox. Reduction 73%
" Oxidation 64%

To try the influence of the size of scale! (silvered 0.3-15)

#145 between 18 & 20 mesh.
Weight: 4.92 g. 25 loops wire 0.55 g
(3×2.6) Red 3.2 (2.8) 3.0 (2.9) 2.5

Mox Red. 78 %
" Ox 70 %(?)

#146 Weight 5.33
Between 20 & 40 mesh
25 pdw. wire 0.52g.
(Ox 2.9) Res 3.2 (2.9) 3.1 (3.1) 3.3
(2.7) 3.2

Max Res 75%
" Ox 70-74 (?)

#147 Weight 6.86
Between 40 & 100 mesh
25 pdw. wire 0.62g.
Ox (3.5) Res 4.0 (3.6) 4.4 (3.7) 4.5

Max Res 80%
" Ox 65%

#148 5.58g.
Between 0.5. 15. Age 20 to 40 min.
0.5 Wire 25 double & golden.
(Ox 3.0) Res 4.8 (3.2) 4.5 (3.1) 3.3

Max Res 80%
" Ox 66%

#149 6.00

Silver scale (0.5 to 1.5 g)
leached with Nowem, silver
copper ribbon, 3 layers, 0.3g
Soldered to grid
(0.30) x 30 (2 hr) 30

Red 60%
Ox 60%

#150

Pulverized crystals formed during the oxidation of Ag powder on the copper foils during the reducing of the silver powder covers the silver. This coating will oxidize before the beads and invisible these.
To prevent this the solution after each oxidation is filtered through powdered Zinc in a beaker. The Zn prevents the Cu and forms the complex $Zn(NH_3)_4^{2+}$

#157

Two bundles of silvered copper wire as used in all previous cells. One silvered by dipping in strong Cyanide bath & one 2) plated by current in a weak Cyanide silver sol. - used as pole in a very soda sol. Current 0.25 Amp 10 min after start - the first bundle being the oxygen pole - the sol colors blue & the silver has been penetrated. The other bundle (electroplated) holds a little longer, a ring probably on account of thicker layer of silver.

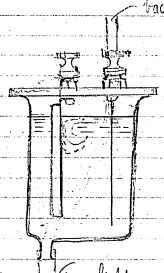
#152

Scale, silvered in Cyanide (used 0.35 Ag/Cu ratio 15 g Cu. coat) put into cell on a nickel disk.

At the first oxidation the "brown oxide" is anodic after reversing, the rubber

coating seems almost unchanged. After second oxidation, an oxidation of ½ hour is allowed; now silver the scale has lost almost every trace of silver

#1575 6.7
Scale, nickel plated by current (in Bunte sulphate of Nickel & Ammon). The plating probably rather thick.
Packed run grid with nickel plated copper wire (0.3g)
The nickel wire stands oxidation much better than silver do.
(Ox 2.0) Red 2.0 (2.1) 2.2



To prevent the Sodium Cyanide from commencing to contact with the zinc, the soda solution is continuously circulating from cell to a filter containing zinc and back to cell.

The fresh soda runs down along the zinc, the cast

is under the copper-cell

154

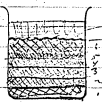
Rate of evaporation ca. ½ gall per hour
Bubbling at filler ca 1½-1¾
Current 0.25 Amps
The engine is 2 cylinder type
connected with No. 0
(precipitator out of

Zinc lapsed all night during
first ¾ hour. Then
black spots of spongy
zinc appear.
The nickel plate has now
been perfectly clean for
the entire time
Hydrogen and forms bubbles
appear between nickel and
zinc.
When current is turned off
the zinc gives up gas.

Microgonidia after 1½ hours
on Nitrogen Stock
action of small amounts
of decomposition copper on
Nostoc a short exposure
through 2 wet covers

To stop the transmission
I supported above the surface
of the liquid a piece
of sheet glass so inserted
between the electrodes
intersecting the cell diameter
and to a depth of ½"
below surface

155 Improved filter.



Copper beaker with 2/32" holes through bottom

8		1-6 crushed charcoal
7	1	12-14 mesh
6	2	14-20 "
5	3	20-40 "
4	4	40-60 "
3	5	60-80 "
2	6	12-14 "
1	7	#13 screen cross
	8	Zinks in drops.

#156

New plate carefully prepared
Like Expt. #155
Pots. 1st current 2 amps 1/4 gals
25°, 30° per hour.
0.15 amps.
Pots 3.15 pr
Scarcely 1/2 HH before black
spots appear

#157

Same over again
Plate rubbed with emery paper,
rinsed well and cleaned with
The cupreole still reaches the
Zinc and gives black spots
as the start run.

#158
Matte platinum color on sheet of copper oxide. Nickel plate, not polished. Cleaned with pumice & rinsed. Clarity of glass one of the best. Most colors black specks with ½ NH

#159 Same as 155. Perhaps a little smoother surface; gives very little glass.

#160 The same. Plate cleaned — dil. HNO_3 gives some glass. Spots not on #157 spontaneously in oil, cleaned with HNO_3 and rubbed with pumice.

#161, 162, 163, 164

Distinct differences in degree of polishing
Gold dipped in HNO_3, nickeled, nickeled boiled in ammonia, water and rinsed with
All have up about same resistance, and all show black sparkly spots after 3-2 AH

#165

Nickeled plate treated with Sodium amalgam
Gives less gas than preceding plates black spots after 1 AH

Title now the solution used is a mixture of water, dissolved by a little acid and is in which a small plate (Pt. Edison Label) has been transmitting current

What is the reason for the passing? Does the positive ions take part in the converging and at the zinc pole precipitate [illegible] part of the H_2O to the zinc deposited together with impurities from the sol so as to make local actions. Or in the case of the amalgamated plate, can the impurities in the nickel by creeping outward with the amalgam form a continuous local action.

It might be possible that the ions are Na and $Zn(OH)$ the latter recrystallizing at the anode, the former precipitating particles Zn and H from $Zn(OH)$ and H_2O.

New Nickeling bath from Soluble Sulphate of Nickel & Ammonia (from Photographic works

57

#166

New Solution from pure $ZnSO_4$ (precipt. from $ZnSO_4$ by $NaOH$ & NH_4) dissolved in ca 20% $NaOH$ c.p.

Amalgamated Plate

No gas

But rather early - not spongy but abundant crystalline deposit

During first 2-3 min. the current was kept at .32 A.

The plating is rather rough but white.

The first 1½ MM deposit may be called good, then it grows darker and brush-like. On plating off (after 2½ MM nearly) the tops of the brushes will fall off

#167
Mat amalgamated, not gassing
test, nickeled anode. Same
same - current at 2.2 as
in 166 tests. Very little
gas but spongy dark
deposit after 1/4 hr.

#168
As 167. Some slight
deposit NB after 1/4 hr.

#169
Exactly as previous exp.

170
Plate nickeled very thin,
amalgamated
No gassing but poor
deposit after 1/4 hr.

#171
To test the sol from Carlyn exp. (before #166) for copper.
Sol electrolyzed using precipitated on HNO_3 sol acid. After 6 hours cathode strong current (0.6 Amps) no trace of impurity on platinum cathode, consequently no copper.

#172
Poliobier plated deposit on HNO_3 (nickel) beautiful coating — in the new sol No gas bubbles deposit.

#173
New Tube Lot. # 155
155 renewed

174

cc 15 plates slightly varying in degree of polished and rest of the facing. Some better than others. Number two is the best.
No plates reached beyond 1/2 AH.

175

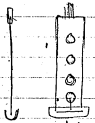
2 Plates one with and one without amalgam put into complete cell with copper plate # 176 both below 1/2 AH.

#176

a square glass: 2" x 2½ x 4" used instead of tumbler, because it allows a better regulating of the stream of soda.

7/5'00 63

#177



Nickeled nickel plate amalgamated on lower end dipped a little glass trough with mercury.

During the plating the mercury warmed upward and formed with the deposite onto the amalgam

Current 0.25 Amp

3.00 pm 7.15 mercury cell (1 AH distributed over the plate current reversed discharged with 0.5 Amp.

At end of charging the surface both perfect.

Discharged 3/4 AH - Surface OK.

Put more mercury into the glass tube.

Discharge 9.00 pm 0.25 AH

Ins. stopped at 11 pm (0.5 AH)
A rather high amount of Zn is deposited on the mercury trough and prevents the Hg globules flowing freely, whilst the bore surface turns dark blue.

178.

Amalgamator plate 10.32 g Hg in the cup.

10½ a.m. 0.25 amp.

After 2.1 AH. changing the deposit becomes crystalline and does. all the mercury in the risers up for amalgamating the zinc.

After discharge the mercury in the cup contains best. 6% zinc.

#179

As the zinc is partially deposited on the mercury in the cup preventing it from amalgamating at the upper part of the plate, a cup is used, which fits rather tight around the plate

As in previous experiments a copper pan (#148) and filter are used

At first the cup contains 14.5 g Hg. After 1.4 AH. the surface, especially the lower part of the plate is rough and begins to form brushes, that however do not drop off on shaking or when discharging.

P.6. AH - Require 5 g. Hg

The Mercury in the cup may contain some Zn

in spite of the small space

Use discharge tube mercury guard especially when down again ... the cup – at all events not [illegible] the bridge.

8.40 pm Discharging with 0.5 amps.

(Zinc per AH: 1.22.43 g)

(Pt " " 3.881.2 g)

Discharged 1.25 AH

The mercury all flows back into the cup

Charged 1.5 AH

Much more visible than first time

5.30.

Discharged 1.5 AH the pellicle at this point starting to gas, consequently there is

Zn in the mercury drops in the cup.
The 3-4 longest bristles could not be redissolved not even after mercury was blown from the whole surface.

#180.
New plate, amalgamated test rod with platinum wire as anode.
14.45 Mercury in the cup.
9.30 0.25 Amps.
11.00
9.00 2.5 AH.
Pure, surface with brushes especially on lower part.

Discharge 0.5 Amps.
Leaves nice nickel-amalgam surface except where the longest bristles are. These remaining even after mercury

Legius les ordres

Ca. 10 cc of the soda sol with zinc (from complete cells tests) yellow tinge through zinc plate, mixed with H_2WO_4 till precipitate redissolved.
Cathode remains clean
Anode becomes covered with a yellow-red coating, which by dipping into H_2WO_4 shows all the colours of the spectrum
Apparently lead oxide.

In a sol. where H_2S_{0x} is used the same takes place except that Zn deposits on Cathode.

A 182

Good amalgamated plate without any [illegible] Perfect after 1 AH.

Discharged by short circuiting with copper plate (ca 0.5 A.

After complete discharging the mercury covers the entire plate

Charging 1 AH

Discharging by current 3/4 AH

Simple rule.

Charging 3/4 AH, plate still good.

#183
10# Plate runs ½ AH work
Measuring cups. Mea this remo
ved. Further ½ AH plates good.
One edge of the plate needed
to be trued. Thrust brushes,
but not block

~~#184~~

184

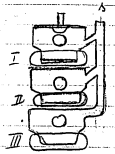


Plate divided into three parts arranged one over the other, each with its mercury-cup.

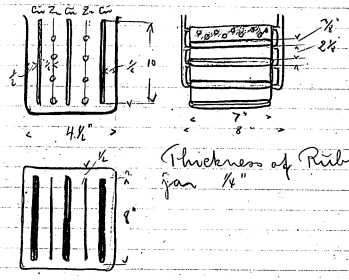
Surface 4.5 □"

I contains 1.5 g Mercury
II 1.5 g.
III 2.0 g
5.0 g

First plating 2.5 AH, surface rough but perfectly pure.

When the amp. is an amalgamator the Hg will tend to collect at the lowest point of the lower plate.
— Plates down.

#185



Thickness of Rubber jar ¼"

Surface of two zink plates
238 □"

According to #183 the capacity is
$\frac{230}{45} \cdot 2.5 = 130$ Amp Hours

Zink deposited: 130. 1.224 = 160 g

Mercury in the cups
$130 \cdot \frac{2}{25} \doteq 260$ g

According to exp # 143 - 150 & ct the copper needed for the deposition is:

$\frac{130}{0.65} \cdot 1.9 = 298$ g

Silvering & silver were ca. 6% :
316 g

Two nickel plates for the zinc poles; thickness 30/1000.

2 × 7 × 18 × 30/1000 = 4.2 cub in

Weight: 57 g

Volume of Zn dep.: $\frac{0.160}{6.5 \cdot 0.015625} = 1.58$ cub in

Vol. of Mercury $\frac{0.200}{13.6 \cdot 0.015625} = 1.2$ cub in.

Vol of Copper ox:

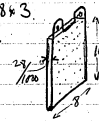
Vol of small spot: 3/4 × 1/4 × 5/32 = 0.1465

weight ~ 7 g

Vol of 316 g: 6.6 cub in.

Thickness of grids:

$\frac{6.6}{10 \times 8 \times 3} = \frac{28}{1000}$



Thickness of plate $\frac{18}{1000}$

Volume occupied by the nickel grid:

$6 \times 8 \times 10 \times \frac{18}{1000} = 8.64$ cub cm

weight of nickel 10.20 g

Vol. of Solution:

$9 \times 4\frac{1}{2} \times 10\frac{1}{2} = 425$

Vol of poles subtracted:

$425 - (4.2 + 1.58 + 1.2 + 16.6 + 8.64) =$

$= 392.78$ cub cm $= 6.3$ l.

Weight $= 6.3 \times 1.3 = 8200$ g

Weight of Pinhofer gas water cover.

1/4	9 1/4 × 4 3/4 × 2 =	88	= 772.5 cub.
1/4	9 1/4 × 10 3/4 × 2 =	200	
1/4	4 3/4 × 10 3/4 × 2 =	102	
		390	

Weight = 725 · 1.5 = 1088 g

Weight of zinc deposit	160 g.
Mercuring	260 "
2 Nickel plates	557.
Allowance for Construction	123.
Weight of Zinc pole	1100 g
Weight of Copper oxide	316 g.
5 plates	1070.
Allowance for crush.	114.
copper pole	1500
Rubber jar with cover	10,900 g
Soda. sol	82000 g
Weight of Battery	11890 g
= 26 lbs.	
per Amp Hour 0.5 lbs	

Continuation of #184.

After the first plating and discharging the cell is short-circuited, the other pole being a platinized platinum plate.

Worst plating 2.5 A H.

The plating off by a mistake was continued a few minutes too long, so that parts of the metallic zinc oxidized to yellow oxide. At begin of plating this drops off in some places leaving dark spots.

Plates 2.5 A H.

When the dark spots were the zinc dots appear.

If the plate half zinc plated is kept to itself for a short while, the charging will smoothen the surface nicely.

#186

Five plate form #184.

2.5 g Hg in two upper cups.
2g in lower.

3.00 AH O.K. 3.25 good
3.5 a little ba Sparking or brushlike
discharge 0.5 Amps. 3 Amps hum

$\left(19 \times \frac{3}{16} + 10 \cdot \frac{1}{16}\right) \times 2\frac{3}{4} =$ **13**

25 ½ =

88

#187

Distance between electrodes ¼"

Zinc corrugated ~~3/16~~ 3/16"

as 02 to give twice the surface of an equally dimensioned plane plate.

According to #185 we get of a 4.5 □" plate 3.25 AH when using 7 g Hg

Cell of same dimensions as in #185

Surface of two Zinkpoles: 460 □"

Capacity: $\frac{3.25}{45} \cdot 460 =$ 332 MA

Zinc deposit: 332 × 1.224 = 406 g

Mercury = $\frac{7}{3.25} \times 332 =$ 715 g

2 Nickel plates (10/1000) 325 g

For Consth 164

Weight of Zink element. 1680 g

Copperoxide: $\frac{15}{8.07} \cdot 332 =$ 780 g

2 Knots (5/1000) 225

For Construction 180

1150 g

Thickness of Copper plate:

$\frac{30}{3.7 \times 10} = 0.145"$ (+ 2 × 0.005)

Size of zinc plate: 3/16 + deposit

Total thickness of Battery:

$6 \times \frac{1}{4} + 3 \times 0.155 + 2 \times \frac{1}{4} = 2\frac{1}{2}"$

Volume of	Zn	4.3 □"
	Hg	3.3 "
2 Nickel plates		2.3 "
Copper plate		30.0 "
3 Grids		2.4 "
		42.3

Volume of Rubber jar:

$8\frac{1}{2} \times 2\frac{1}{2} \times 10\frac{1}{4} = 218$ □"

$= 3.4$ l

Weight of Soda: $3.4 \times 1.3 = 4.5$ kg

Weight of Rubber jar: 1.77 kg.

Zinc element	1600 g
Copper "	1150
Iron	1720
Brass + (0.5 Zinc)	4650
	9,120 lb

= 20 lbs

$\frac{332 \times 0.07}{20} = 111$

Ammonium chloride cells

4,5 – 3.0 – 4,8 – 5.5

63

#188

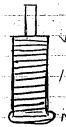
corrugated nickel plate of
surface
$2\times(19\times 3/16 + 18\times 3/16)$ 2 1/2 = 23 □"
7.8 g measuring all in
a cup attached to the bottom
end.
2/5 8.15 pm , 0.25 A

mm surface = 1/4 area of
plane plate.

#189

84

Nickel plate corrugated in horizontal direction



Area = 9.84 □"

(6 times that of plane plate)

1 5/8.

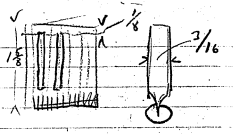
8g Mercury

40/7 9.45 a.m. 0.25 hyp.

Bleeds spots on upper joint after 2.2 hrs.

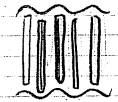
Very poor

2. 68.



#190

85



cut out

cut out

cut out

Surface 7 □"

25 times that of plane plate

10 g Mercury

Weight of 10 strips $1 \times \frac{3}{64} = 0.32$ g.

$\frac{1\frac{1}{16}}{1\frac{15}{16}} \times 4.15 = \frac{17}{15} \times 0.32 =$

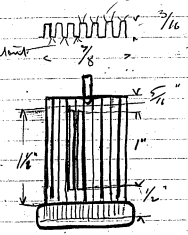
$15 \times 1\frac{1}{2} \times \frac{3}{16} \times 2 = 8.5$

$\frac{8.5}{2.6} =$

$2 \times \frac{7}{8} \times 1\frac{1}{2} = 3.3$

#191

86



Surface 8.5 d'
= 3.2 times that of plane plate.

Both test plates poor.
In Rep. 3 almost only on the tops, and the plate takes scarcely more than the plane projection would be.

#192.

87

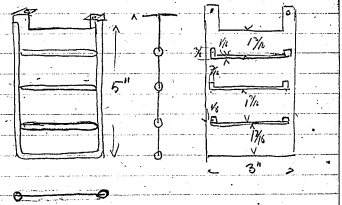


Plate consisting of 4 parts all dipping in cut glass tubes each containing 3 gl Hg. Surface 17 □"

Positive poles joined by two strips of platinum 5/8 by 3"

The anode are too small, causing the Hg to deposit on the bare brushes and middle of plate leaving the other plate almost bare.

#. 193

Same plate with the small connecting strips (9) asphalted as to

do prevent

marching from running down inter lowa parts.

Pouring pails two nickeled nickel plates 5" × 3" ea 3/8" found pellets

Cast cup Hg. Mg

Surface very nice after 12½ AH. Corresponding to 3.25 on the small plate #184

The current ought to have been 1 amp, but to help the amalgamation let but to be diminished – 0.75 Weight of sections probably too large

The amalgam formed as after 12 AM still perfectly bright, and might stand more Zn if it was not so brittle

If the space between the poles could be filled with glass-wool or asbestos without meeting other difficulties, the Zn might be deposited, as long as it would stay undistinct bright, without any danger of dropping off

#195

Plate #192 with the positive pole former of one tube sent around the negative pole - and the space filled by a layer of glass wool 6g Hg in each tube

After ca 10 hh there has and a spot when the layer of wool has been to loose, formed a bridge over to the anode

— The amalgam is nicely interwoven by the glass wool and a disappearance of absolutely prevented

#176

#183 with positive leads like in 195 and space filled by pure asbestos.

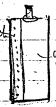
Here the resistance between the poles is still more irregular so that a bridge is formed after ca 2 Min

#197

Plate with a strip of asphalt. Warm plate and rubbed with piece of asph. After a short time while the asphalt is broken off from plate

197

Plate with a row of holes along the edge. Warmed and dipped into melted asphalt



After 3 hours plating shell perfect

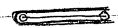
After reversing Horse shell alright

After one week, run in both directions shell OK

Small holes through the asphalt formed by air bubbles in the melted stuff

#198.

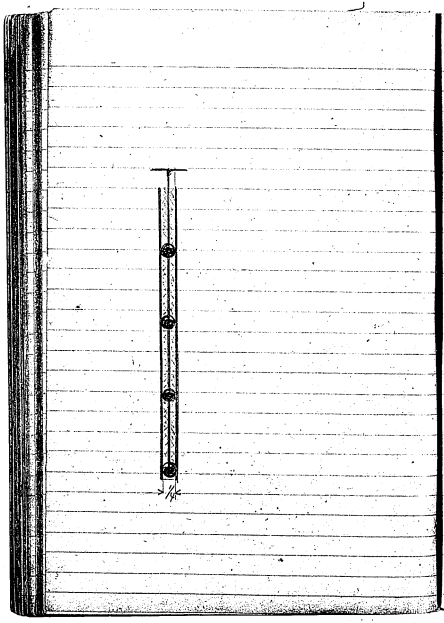
Plate #185 with new positive plate formed by a sheet 1/32" thick



glass wall stopper in between plates allowing trying to get Mn come directly all way down

Heated after 28 Mn where the [illegible] is homogeneous, the zinc deposit is ideal, but there were a few binder formers.

A very loose packing of glass wool might give better results. But Mr. Edison abandons the glass wool for sake of its solubility in soda.



199

New plate like #192
Surface 16 □"

Packed with jewelled asbestos 24 ½ Hg.

Opened after 15 hrs.

Where the asbestos has been packed tight and hammered, the zn deposit is finely distributed in the first ⅛" of the cathode, especially in old cracks and where there is a similar opening or less dense place in the layer of asbestos fibre. will be formed a bridge the cell thus being short circuited.

Mr Edison gives as one reason of the difficulties in getting a circulation in the cells

#200

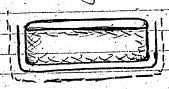
Plate #183 with
8 g Hg and Amon. #198.

After 1 hr and 4 ½" the
surface is fine - there
may be a number of some
crystals with a finger,
and a drop goes off from
shaking in desiccator

Fritsche 8 g Hg

On glass, where the
amon. the cathode
the current density will
be higher and the forms
of branches or crystals will
otherwise connect. So is the
case along the edges of the
plate

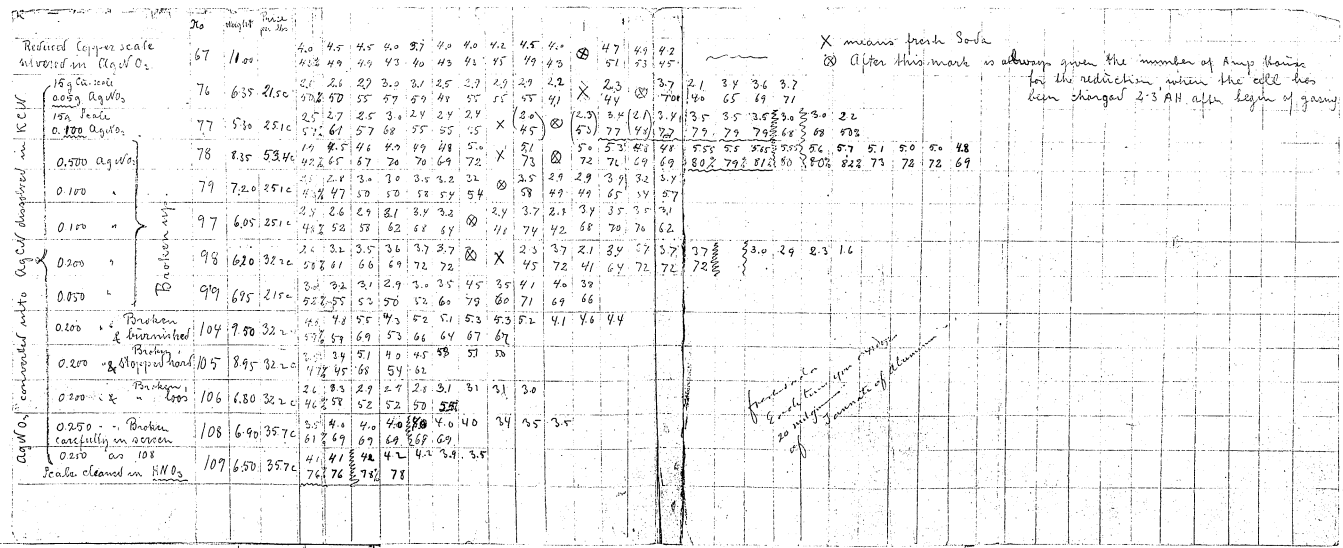
Section of the plate



#207
Same as #200 anode cut as in figure 8g mercury Hg

Plate OK after 8 AH
discharge 7 AH when the largest Pt. electrode, which is last plate down quite even
2g mercury in each tube : 8g

[ITEM FOUND IN BOOK]



[ITEM FOUND IN BOOK]

I Positive pole brought to slight gassing then reversed:

5% Sulfuric acid

Voltage	Current	Resist.
9.39 pm .45	.0790	(5.7 Ω)
9 39½ .38	.0790	4.82
40	36	.0790
45	.322	.0790
50	.303	.0780
55	.300	.0782
10 00	.298	.0780
5	.297	.0775
X 10	.299	.0770
15	.301	.0776
20		
25	.370	.0770
30	.372	.0770
45	.396	.0773
55	.490	.0790
1100	660	.0795
05	800	.0800
10	1.300	.795
15	1.740	.802

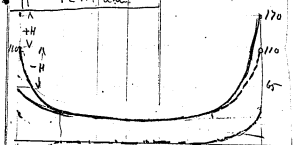
2 coul.

High resist. due to Hydrogene and points of contact between grid and copper being transformed into black CuO(?)

Reversed

11.30 pm	.54	.0785
35	.42	.079
38	.365	.0785
42	.355	.0784
53	3.40	.0780
58	3.30	.0792
12 03	3.05	.0794
8	3.18	.0794
13	.345	.794

Off at 12.14 am



Real resistance curve ----

Result ant curve ——

Polarization curve .—.—.—

45 170
155
125
80

[ITEM FOUND IN BOOK]

After 20 hours soaking in the 5% sol exp continued:

8.23 p.m.

8.23 30	42	.077
24 "	345	.077
25 "	—	.077
27 "	370	0762
28 "	380	0768

Soaking apparently if not influence at all: 12.14 a.m. .345 (.079)
8.28 p.m. 370 (.077)

Reversed on 5% sol

8.30 "

Plate now 3880 ex hour after.
7078

8.30 85"	.22	.077
31 "	.234	0768
32 "	.245	0768
33 "	245	
34 "	244	
35 "	250	77
38 "	259	
39 "	260	

Res. it during this time work up for concentration in negative plate. It is it on a strongly ascending curve of resistance?

change of sol gives in all 20% decrease of resistance

Dropping during these 5 min due to slow change of sol in pores pole or really on positive plate

10% sol

8.40	215	77
42	211	77
44	211	77
45	211	77

20% sol

8.46	200	77
48	200	
50	203	77

5% decrease of Resist ance We are on the ascending part of the curve (?)

20% Concentrate [Probably around 50%

8.51.	368	765
52	372	764
53	391	762
54	403	761
55	407	760

now back into 5% sol

8.56	.245	0762
57	240	762
58	239	
59	239	
60	240	0760

Effect of this very evident. Slowly reviving sol in pores (i.e. pores) but curve ascending along

[ITEM FOUND IN BOOK]

By transferring from 5% sol
to 10% sol:

in 5% Sol		in 10% sol	
8.30	.22 Volts.	8.40	.215
8.15	.25		.004
8.39	.26	.45	.211

As the curve is ascending, the drop due to change of sol. in the pores can be just ca. .008 or 3% of the whole change.

For first part of Curve -
from ~~Sack~~ 40% sol to 20%.
Observe drop during first 10 min to determine rate of ~~ion~~ exchange of sol in pores.

.1225 (7)
2/0

24 - 10

.490 .272

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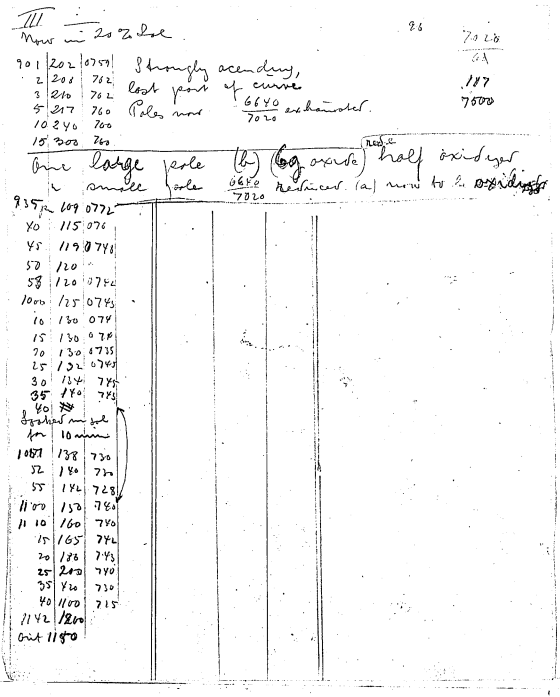

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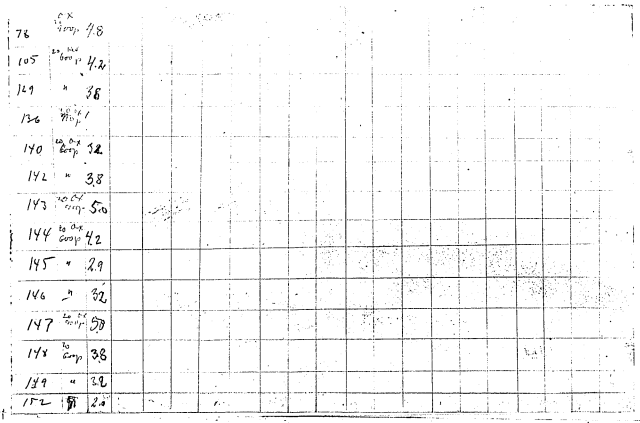

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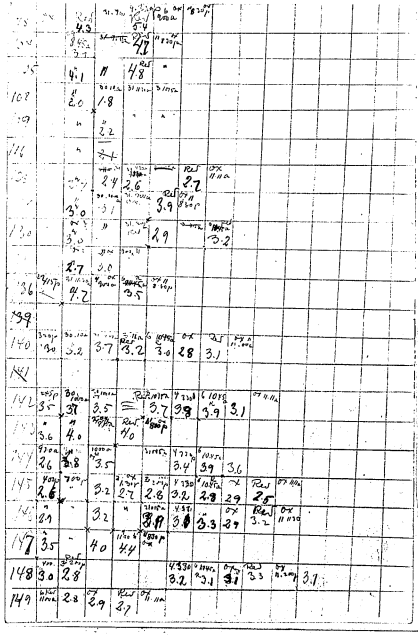

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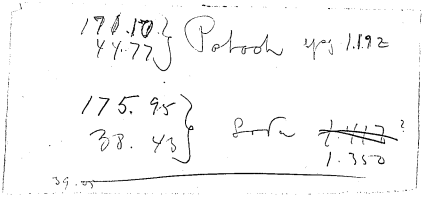

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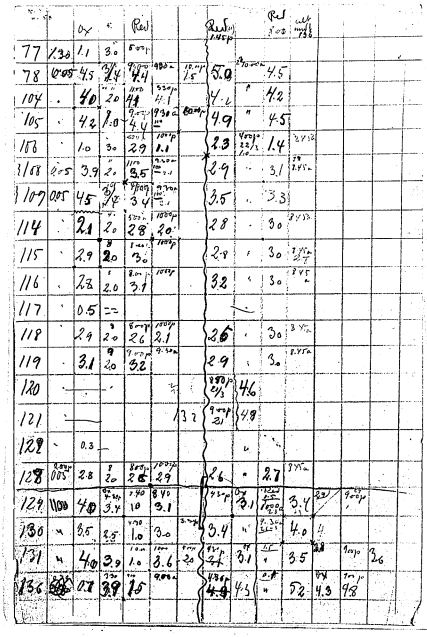
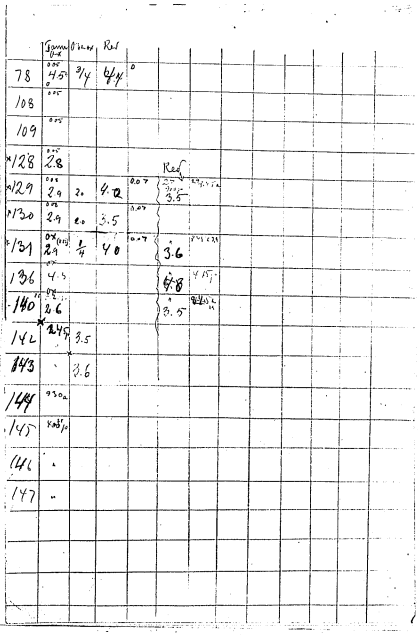
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